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ABSTRACT

In order to investigate differences between the comprehension of high or low imagery passages of long or short length, a study analyzed the reading comprehension of fifth grade pupils (all reading at grade level). Thirty subjects read 16 passages each: four high imagery/short; four high imagery/long; four low imagery/short; and four low imagery/long. Imagery of a passage was determined by matching the imagery level of words in each passage with two predetermined word lists with imagery ratings. Comprehension questions consisted of three factual and three inferential questions written and field tested for each passage. Pupils, tested individually, read each passage silently. A verbatim record of oral answers to questions was recorded for later scoring. Results showed that total comprehension of high imagery passages was significantly greater than low imagery passages regardless of length. Factual questions were generally answered significantly better than inferential questions. The study suggests that imagery as a mediator appears to be one of the determinants of comprehension. (Four tables of data are included; 24 references are attached.) (SR)

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The Effect of Level of Imagery and
Length of Passage on Reading Comprehension

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Abstract

The differences between the comprehension of high or low imagery passages of long or short length were investigated. Thirty fifth grade pupils who were reading on grade level read 16 passages each; four high imagery - short, four high imagery - long, four low imagery - short, and four low imagery - long. Imagery of a passage was determined by matching the imagery level of words in each passage with two predetermined word lists with imagery ratings. Three factual and three inferential comprehension questions were written and field tested for each passage. Pupils were seen individually and read each passage silently. A verbatim record of oral answers to questions were recorded for later scoring. Total comprehension of high imagery passages was significantly greater than low imagery passages regardless of length. Factual questions were generally answered significantly better than inferential questions. Imagery as a mediator appears to be one of the determinants of comprehension.

The Effect of Level of Imagery and Length of Passage
on Reading Comprehension

A mediating process in learning, imagery has a philosophical and research base dating back to 1984 when Wundt postulated that all thought processes were accompanied by mental images (cited in Huey, 1968). Huey (1968) refined the concept to include that relational and connective words had no imagery. Imagery is defined, for the purposes of this paper, as a mental representation of a pictorial form elicited by an isolated word or a group of words; an internal representation (Block, p. 9); and not a picture (Kosslyn, 1980, p. 18). By gaining more information on how students react mentally to imagery in prose passages, researchers can further define mental processes used to recall information. The primary purpose of the research reported here was designed to add additional evidence of the influence of imagery on prose comprehension of different lengths of passages.

Imagery appears to be a developmental phenomenon. In his review of research on imaginal processing, Pressley (1977) concluded that older students internally elaborated for prose whereas six and seven year old's could only elaborate for paired-associate learning. Kosslyn (1980) discussed the idea that images are representations underlying the experience of seeing. This notion assumes that imagery is related to the concepts of abstractness and concreteness. Thus, the mental

representation of "elephant," is different from the representation of "such."

The effect of imagery on the comprehension of prose has been the subject of recent research (Steingart & Glock, 1979; Miccinati, 1981; Sadowski, 1984; Sadowski & Goetz, 1985; and Gambrell, 1981, Gambrel & Bales, 1986). Most of the studies reflected the induced imagery procedure (i.e. students were given instructions, prior to reading, to try to see "pictures" in their heads while reading). Conclusions from this type of research were clear; induced imagery instructions to middle and upper elementary school students improved comprehension of what had been read.

Research on the effect of length of passage on comprehension is not as clear cut. A search of the ERIC system, using the descriptors "reading comprehension" and "reading research" with free texting of "length of passage" and "passage length," yielded a limited number of references germane to the topic. A more limited number of references were cited in Dissertation Abstracts.

The studies on length of passage on comprehension usually investigated length in conjunction with other factors. These studies examined retention scores for long versus short passages in which the short passages were rewritten taking into account responses to similar content long passages (Newsome & Gaite, 1971); text lengths and densities of objective-relevant text

components (Kaplan & Rothkopf, 1974); short and long passages in an informal reading inventory and basal reader (Bowden, 1978); varying length passages related to questioning and retelling (Grant, 1980); and effects of length on the recall of text with tests of fixed size (Rothkopf & Billington, 1983). Three of these five studies reported that comprehension scores declined as story length increased (Kaplan & Rothkopf; Bowden; and Rothkopf & Billington). Forming generalizations based on the data proved difficult because of (1) the variances in passage lengths which ranged from 47 words (Bowden) to 2689 words (Rothkopf & Billington); (2) the differences among the subjects, fourth grade pupils (Bowden), high school students, and college students (Kaplan & Rothkopf; Rothkopf & Billington), and (3) dissimilar questioning formats (i.e., multiple choice, completion, and retelling). No references to the measurement and evaluation of comprehension related to length of passage x imagery were found. However, the length of a passage would appear to be directly related to comprehension in as much as a pupil would have to process and store more in memory in order to answer questions correctly. Therefore, length of passages may affect reading comprehension as does the imagery rating of a passage. The specific question of this study, then, was would the length and level of imagery of a reading passage affect comprehension of fifth grade pupils?

Method

Subjects

Three Knoxville, Tennessee elementary schools having at least two fifth grade classes each were randomly selected as the setting for this study. The pupil populations of each school were heterogeneous as to social and economic class. All fifth graders in each school completed the comprehension sub-test of the Gates-MacGinitie Reading Tests (1978). Thirty-three pupils from all fifth graders in the three schools who attained a grade placement score within the predetermined range (5.0 to 6.0) of scores were randomly selected. The voluntary withdrawal of three qualified pupils reduced the final sample to thirty pupils.

Materials

Two major types of materials were used; published word lists that rated isolated words on imagery evoking properties, and social studies text. Several isolated word lists have been classified on an imagery dimension (Paivio et al., 1968; Toglia & Battig, 1978). The Paivio et al. list contains 925 nouns taken from the Thorndike-Lorge List (1944). College students rated the nouns chosen by Paivio et al. on a seven point scale to determine imagery, concreteness, and meaningfulness. The standard deviation was computed for each word's ratings. Using this method, Paivio et al.'s. rating for /arrow/ had a mean imagery score of 6.57 and a standard deviation of 1.07. The Toglia and Battig

(1978) list enlarged the number of words and different parts of speech with ratings. The same method of rating the words was used by both researchers. Van Der Veur (1975) replicated the Paivio et. al. word ratings using middle school students.

The words from the word lists were classified a priori by the experimentors into the categories of high (5.5+) middle (3.30-5.49) and low (1.0-3.29) imagery by parts of speech. Thus, there were categories of words as noun high, noun middle, noun low, adjective high, adjective middle, and adjective low through all parts of speech. These categories were input into the computer and a SNOBOL program written to match the words to any text. (For a more detailed description see Terwilliger and Kolker, 1985.)

Two elementary school fourth grade social studies textbooks (Scott Foresman, 1979; Macmillan, 1982) not in use in the local public schools, provided the sources for the reading passages. Fourth grade texts were chosen to insure that fifth grade readers would have minimal word recognition problems. The number of words in a short passage ranged from 177 to 218 and in a long passage from 385 to 440. The number of words, short versus long, were chosen so that there would be sufficient text for concept development and yet the length not be overwhelming for fifth graders.

The content of the text selected from the social studies

books were Lincoln freed slaves, Wales, towns and cities, rubber becomes important, using coal, radio and TV, the President, floods, energy shortage, people need government, the Legislature, river pollution, deserts climate, harvesting a forest, the Supreme Court, and Lincoln's boyhood. Each text was computer matched to the dictionaries of words and an a priori ratio of high to low words determined whether the passage was of high or low imagery.

The pupil's final set of sixteen reading passages contained a group of eight short and a group of eight long passages; four rated as low imagery and four rated as high imagery in each group.

An experienced reading instructor wrote a motivational statement as well as three fact and three inferential questions for each of the reading passages; and these were placed in the instructors reading booklet. The sequence of the questions followed the story line of each reading passage. The text only was included in a reading booklet. The reading passages and test questions were field tested. Ten public school teachers had pupils read the stories and answer the questions. On the basis of the field testing, editorial revisions were made in the phrasing of the questions.

Procedure and Design

Two clinicians administered the Gates-MacGinitie, Level D, Comprehension sub-test to all of the fifth grade pupils in attendance at the three randomly selected Knoxville City Schools.

The norm referenced test was administered so that the investigators could be reasonably sure the pupils could read fourth grade material. Pupil screening and selection occurred one week prior to the scheduled experiment. Collection of data required a minimum of one week per school and was done between 9:00 a.m. and 11:00 a.m.

Each pupil followed an identical sequence of silent reading of the passages used in this study. A short passage preceded a long passage.

Each pupil who was selected met with a clinician each morning for four consecutive days to complete a session of four daily reading exercises and accompanying comprehension tests. Each daily pupil reading session followed a set pattern for each reading passage. The clinician read orally a motivational statement and the pupil read silently the passage. The clinician read orally each comprehension question and recorded verbatim the pupil's oral response. The pupil could not look back at the text for answers. An experienced reading instructor scored all of the pupil responses to questions at the completion of data collection on an "a priori" criteria set by the investigators. The answers were scored either correct or incorrect.

The length of the reading passage, type of comprehension question and level of imagery were the variables in the study. Repeated measures analysis of variance was used for statistical

treatment to determine the level of significance of existing differences among pupil responses. The dependent variable was the number of comprehension questions answered correctly. Thirty pupils read each set of 16 passages and each passage had 6 questions ($30 \times 16 \times 6 = 2880$ total questions). Of these, four high imagery-long passages had 24 questions ($4 \times 6 = 24$) for each pupil (total 720) as did low imagery-long passages, high imagery-short passages, and low imagery-short passages. F values were from PROC GLM.

Results

The effects of imagery and length were examined across total comprehension. Total comprehension included the two types of questions: fact recall and inferential comprehension. The types of comprehension for each effect were examined.

The effect of the length of the passages did not appear to exert a significant difference on total comprehension scores or inferential comprehension. The findings listed in Table 1 show the patterns of pupil responses to comprehension questions. Although a pupil's total comprehension score was greater for short passages than long passages $F(1,1440) = 1.17, p < .28$, the difference was not significant. Inferential comprehension followed the same pattern $F(1,720) = 2.38, p < .13$. However, the pupils answered significantly more fact questions correctly for short passages than long passages $F(1,720) = 9.96, p < .002$.

Insert Table 1 about here

The level of imagery, regardless of length of the passages, appeared to affect comprehension significantly. From Table 2 it can be seen that total comprehension of high imagery passages was greater than for low imagery passages $F(1,1440) = 18.40$, $p < .0001$. Comprehension of fact questions was greater for high imagery passages $F(1,720) = 7.83$, $p < .006$. However, comprehension, as measured by inferential questions was greater for low imagery passages than high imagery passages [$F(1,720) = 12.67$, $p < .0006$].

Insert Table 2 about here

The results of high and low imagery passage comprehension by length can be seen in Table 3. For low imagery passages, there was no significant difference in total comprehension of short or long length $F(1,720) = .16$, $p < .69$. However, the pupils made more correct responses to fact questions for low imagery short passages than long passages $F(1,720) = 7.26$, $p < .008$. Although the same pattern was seen for inferential questions $F(1,720) = 4.40$, $p < .04$, the level of significance was not as great.

Length of high imagery passages did not appear to affect

comprehension. There were no significant differences between high - long passages and high - short passages for total comprehension $F(1,1440) = 1.29, p < .26$, fact comprehension $F(1,720) = 3.13, p < .08$, or inferential comprehension $F(1,720) = .01, p < .93$.

Insert Table 3 about here

The final comparison examined high imagery - long versus low imagery - long, and high imagery short versus low imagery - short (Table 4).

Although the total comprehension of high imagery long passages was significantly greater than low imagery long passages ($F(1,1440) = 7.10, p < .0008$), the comprehension of fact questions followed a similar but less significant pattern ($F(1,720) = 5.97, p < .02$). The inferential questions showed no significant difference for the high or low imagery long passages ($F(1,720) = 2.28, p < .13$).

Insert Table 4 about here

Discussion

This study produced information for greater understanding of the effect of passage length on a pupil's level of

comprehension on passages rated as being high or low in imagery. The results of the study produced evidence that the length of the passage did not appear to produce the same differences and consistency of correct responses as did the imagery factor. The level of imagery seemed to affect total comprehension; however, the length of the passage seemed to have had little or no significant effect on total comprehension. Pupils consistently made more correct responses to those passages rated high imagery than those rated low imagery.

Fact comprehension questions produced greater correct pupil response more consistently than did the inferential questions. The fact questions to shorter reading passages produced a greater number of correct responses than to longer reading passages; and both lengths of passages produced more accurate responses on factual recall than on inferential questions. Pupils, in general, had more difficulty responding to inferential questions than to factual questions, regardless of length of passage or its level of imagery rating.

Imagery appears to be a factor in mediating recall of social studies text for fifth grade students, even overriding length as defined in this study. From prior research using social studies and science material of approximately the same length (short), it was found that high imagery passages were comprehended better than low imagery passages (Kolker and Terwilliger, 1986). Findings

from the current study support the 1986 findings in relation to social studies. Whether this same difference would occur with varying lengths of science material is a question for further research. An additional research question is why responses to inferential questions are consistently below fact questions. Inferential thinking is begun to be developed in first grade. However, pupils may not be ready for that type of thinking until they reach a more mature stage of mental development.

Implications for direct classroom use from the findings of this study are several. First, imagery is important for a fuller understanding of social studies text for fifth graders. Therefore, words and concepts in social studies should be discussed and pictured if possible prior to reading to enhance comprehension. Second, length as defined in this study is not as important to comprehension as imagery. However, research is needed to determine what effect length of passages of 1,000-2,000 words will have on comprehension with imagery as a variable.

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Table 1

Mean Comprehension Scores of Long and Short Passages

Comprehension	N Questions	<u>M</u>	<u>SD</u>
Total			
Long	1440	3.00	1.02
Short	1440	3.44	.98
Fact			
Long	720	1.78	.51
Short	720	1.97	.48
Inference			
Long	720	1.22	.55
Short	720	1.47	.54

Table 2

Mean Comprehension Scores of High and Low Imagery Passages

Comprehension	N Questions	<u>M</u>	<u>SD</u>
Total			
High Imagery	1440	3.28	1.02
Low Imagery	1440	3.17	1.00
Fact			
High Imagery	720	1.99	.50
Low Imagery	720	1.77	.49
Inference			
High Imagery	720	1.29	.55
Low Imagery	720	1.40	.56

Table 3

Mean Comprehension Scores of Low and High Imagery Passages by Length

Comprehension	Low		High	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
Total				
Long	2.91	1.00	3.09	1.02
Short	3.41	.98	3.48	.94
Fact				
Long	1.69	.49	1.87	.51
Short	1.84	.48	2.11	.46
Inference				
Long	1.22	.54	1.22	.56
Short	1.57	.53	1.37	.54

Table 4

Mean Comprehension Scores of Long and Short Passages by Imagery Level

Comprehension	Long		Short	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
Total				
High Imagery	3.09	1.02	3.48	.94
Low Imagery	2.91	1.00	3.41	.98
Fact				
High Imagery	1.87	.51	2.11	.46
Low Imagery	1.69	.49	1.84	.48
Inference				
High Imagery	1.22	.56	1.37	.54
Low Imagery	1.22	.54	1.57	.53